

EFFICACY OF CERTAIN COMPOUNDS AGAINST THE GLASSY CLOVER SNAIL, *MONACHA CARTUSIANA* (MÜLLER) AT SHARKIA GOVERNORATE

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ABSTRACT

The effect of certain insecticides (Agrinate, Vertimic and Actara) and biocides (Zantara, Biovar and Bioranza) were studied at Sharkia Governorate during the growing seasons 2011 and 2012. Results revealed that Agrinate was the highest mortality percentages against *M. cartusiana*, snails, while Actara noticed the lowest one where mortality percentages reached 86.33 and 11.0%, respectively under laboratory conditions. Under field conditions, it was noticed that Agrinate more effective than any insecticides or biocides where reduction percentage reached 77.17% while biovar gave 15.98%. Generally, Agrinate was highly efficiency against *M. cartusiana* (Müller) snails under laboratory and field conditions.

INTRODUCTION

Recently the land snails are considered a serious pest attacking agricultural crops around the world. They cause costly damage to field crops, vegetables and fruit trees as well as ornamental plants (Godan, 1983). In addition to their economic importance the increased pest status has been associated with cultivation of new crops. Further, in some crops the significance of land snail gastropods are only now becoming apparent with the decline in the importance of other pest groups such as insects, for which effective control strategies have been developed (Barker, 2002). Many studies indicated that the glassy clover snail, *Monacha cartusiana* is the most abundance snail in all localities at Sharkia Governorate (Ghamry *et al.*, 1993, Ismail, 1997, Arafa, 1997 and Mohrous *et al.*, 2002). It causes damage with considerable reduction percentages in fresh weight of shoots of Egyptian clover and leaves of cabbage and lettuce crops. Ismail, *et al.*, 2005 and Zedan *et al.*, 2005, So certain chemicals were tested as poisonous baits against certain land snails where this technique was the preference chemicals control methods in this respect (Barker 2002). The present work aimed to study the molluscicidal activity of certain compounds against *M. carusiana* snails under laboratory and filed conditions at Sharkia Governorate.

MATERIALS AND METHODS

I – Snails: -

Snails used in this study were obtained from a filed heavy infesting with *Monacha cartusiana* (Müller) snails at El-Maymouna villag, Meniet ElKamh district, Sharkia Governorate and then transferred in plastic bag to

the laboratory. Snails fed on lettuce leaves for 4 days to acclimatization (Elokda, 1981).

II – Chemicals Used: -

Chemicals used were divided in two groups: insecticides *i.e.* Agrinate (Methomyl 24% S.L), Actara (thiomethoxam 25% W.G) and biocides *i.e.* Vertimec (abamectin 1.8 E.C.) Zentari(*Bacillus thuringensis*), Biovar (*Beauveria bassiana*) and Bioranza (*Metarhizium anisopliae*) Fungi. Tested compounds were obtained from the Central Laboratory Pesticides, Agricultural Research Centre. (Table1)

Table (1): Pesticidal formulations, rate of application and corresponding (poison baits) under laboratory and field conditions.

Pesticides	Rate of application per feddan	Under laboratory condition per feddan			Under field condition per feddan
		0.5 R	R	2 R	R
Agrinate	1 L.	0.5 L.	1 L.	2 L.	1 L.
Vertimic	40 cm.	20 cm.	40 cm.	80 cm.	40 cm.
Actara	40 gm.	20 gm.	40 gm.	80 gm.	40 gm.
Zantari	500 gm.	250 gm.	500 gm.	1000 gm.	500 gm.
Biovar	400 gm.	200 gm.	400 gm.	800 gm.	400 gm.
Bioranza	400 gm.	200 gm.	400 gm.	800 gm.	400 gm.

R = Recommended rate

III – Laboratory experiments: -

The tested compounds were applied as poisonous baits. Three concentrations were prepared as follow 0.5, 1 and 2% from the recommended rate. For preparation baits, three concentrations of each compound were used as poisonous baits by incorporating the appropriate amount of each compound with wheat bran to give 100 parts of poisonous baits. Four plastic jars (3/4 liter capacity each) were used for each concentration. Five grams of each poisonous bait were spread into each box. Control treatment was prepared using bran bait free from any compounds. Ten adults of *M. cartusiana* snails were introduced and then tightly covered with muslin clothes netting and secured with rubber band to prevent snail from escaping. Mortality percentages were recorded 1,3,7,14,21 and 28 days post treatment. Observation of mortality entailed using stainless steel needle according to (Elokda 1981).

IV – Field Tests: -

To evaluate reduction percentages of *M. cartusiana* snails after 1,3,7,14,21 and 28 days post treatment the experiment was carried out in Egyptian clover fields at El- Maymuna, Meniet El Kamh district at Sharkia Governorate during the growing seasons 2011 / 2012. The tested compounds were evaluated of one concentration (recommended rate 1%).

Poison baits were prepared as follows: the appropriate amount of each compound + 3.5 parts of black sugarcane syrup, and then mixed with wheat bran to reach 500 grams of bran bait. Control treatment was designed by the same manner without any compounds. Each treatment was replicated

four times. Baits were offered on plastic pieces each one a bout 125 gm. A live snail was recorded in check and treatment areas before application and after 1,3,7,14,21 and 28 days until the end of the experiment. Reduction percentages were calculated according the formula of Henderson and Tiltion (1955). As follow:

$$\% \text{ Reduction} = \left(1 - \frac{t_2 \times r_1}{t_1 \times r_2}\right) \times 100$$

r_1 = number of alive snails before treatment in untreated plots

r_2 = number of alive snails after treatment in untreated plots

t_1 =number of alive snails before treatment in treated plots

t_2 = number of alive snails after treatment in treated plots

RESULTS AND DISCUSSION

I – Efficacy of certain compounds against *Monacha cartusiana* snail under laboratory conditions:

The effects of six compounds were tested against *M. cartusiana* snail as poisonous baits under laboratory conditions at Sharhia Governorate. These tested pesticides were, Agrinate, Vertemic and Actara as insecticides and acaricides as well as Zantari, Biovar and Bioranza as biocides.

Table (2): Efficacy of certain pesticides against the land snail *M. Cartusiana* under laboratory conditions.

Pesticide	Con%	Mortality % of different periods (days)						Mean of mortality	
		Day	3days	7 days	14 days	21 days	28 days		
Insecticides	Agrinate	1/2	0	0	13.3	23.3	26.6	30	15.5
		I	0	7.6	36.6	86.6	90	93.3	52.3
		II	0	43.33	86.66	90	93.33	96.66	68.33
	Vertemic	1/2	0	0	10	20	23.33	23.33	12.77
		I	0	2.3	6.6	23.3	30	33.3	15.9
		II	0	13.3	26.6	33.3	36.6	40	24.9
	Actara	1/2	0	0	0	3.3	10	13.3	4.4
		I	0	0	10	13.3	13.3	20	9.4
		II	0	0	13.3	16.6	16.6	20	11.0
Biocides	Zantari	1/2	0	0	0	3.33	10	10	3.8
		I	0	0	6.6	13.3	20	30	11.6
		II	0	0	13.3	16.6	20	23.3	12.2
	Biovar	1/2	0	0	3.3	3.3	10	16.6	5.5
		I	0	0	6.6	10	16.6	16.6	8.3
		II	0	0	13.3	16.6	20	26.6	12.7
	Bioranza	1/2	0	0	0	3.3	10	13.3	4.4
		I	0	0	6.6	10	16.6	23.3	9.4
		II	0	0	16.6	23.3	20	33.3	15.5

1/2 = 1/2 Recommended rate

I = Recommended rate

II = fold Recommended rate

Results tabulated in Table (2) revealed that the mortality percentages were increased by increasing tested compounds concentration and by increasing exposure periods.

All tested compounds failed to exhibit any molluscicidal activity one day post treatment. Three days post treatment, it noticed that Agrinate and Vertimec gave mortality percentage reached to 7.6 (43.33) % and 2.3 (13.3) % for I and II concentrations , respectively . By time elapsed , it noticed that Agrinate gave highly mortality percentages for the three tested concentrations where reached 23.3 , 86.6 and 90 % after 14 days post treatment , while Biover gave the lowest one where reached 3.3 , 10 , 16.6 % for the three tested concentrations, respectively .

On the other hand, mortality percentages for highest concentration (II) reached to 96.66, 40.0, 20, 23.3, 26.6 and 33.3 % four weeks post treatment. Regarding mean of mortality of the tested compound it reached to 68.33, 24.9, 11.0, 12.2, 12.7 and 15.5 % at the highest concentrations for, Agrinate, Vertmic, Actara, Zantari, Biovara and Bioranza, respectively. Generally, it could be reported that Agrinate was the highest effect against *M. cartusiana* snails, while Actara noticed the lowest one where gave mortality percentages for the highest concentrations 86.33 and 11.0 % respectively. It could be concluded that Agrinate have the highly efficacy against *M. cartusiana* snails under laboratory conditions.

Heiba *et al.*(2002) reported that the mortality rates increased by the time and most mortalities occurred over five days posted insecticide administration, the maximum mortality rate of 95 and 75% were observed for *E. vermiculata* and *M. contiana* snails after 108 hours by doses of 34.8 and 39.4 mg/ kg, respectively.

Arafa (2006) found that Ecotch-bio (Biocides containing *Bacillus thuringiensis*) failed to exhibit any molluscicidal activity while Diple 2x, Bioclean and Diple- NT gave mortality 97, 97, and 32%, respectively.

Ismail *et al.* (2010) reported that metaldehyde recorded highly efficacy against *M. cartusiana* snails than the other tested pesticides (methomyl and diazinon) under laboratory conditions.

II – The effect of certain insecticides and biocides against the land snail *Monacha cartusiana* under field conditions:

The effect of some insecticides and biocides against the land snail, *M. cartusiana* were determined during 2011 and 2012 under field conditions at Sharkia Governorate.

Table (3): Effect of some insecticides and biocides against the land snail, *M. cartusiana* under filed conditions at Sharkia Governorate.

pesticides	Reduction after indicated days								Mean of Reducti on %
	1 day	3 days	I.K	7 days	14 days	21 days	28 days	R.E	
Agrinate	94.48	92.57	93.29	93.21	75.01	64.94	42.83	68.99	77.17
Vertmic	23.40	21.63	22.51	20.49	12.18	6.56	4.56	10.94	14.80
Actara	13.09	11.89	12.49	9.37	5.99	3.69	4.03	5.77	8.01
Zantari	1.66	4.16	2.91	7.87	10.84	8.50	4.15	7.84	6.20
Biovar	1.47	5.60	3.53	18.28	29.74	25.05	15.71	22.19	15.98
Bioranza	1.56	6.43	4.99	8.08	9.54	7.71	5.12	7.61	6.74

I.K- Initial effects (mean percentage of reduction during the first and the third days)

R.E - Residual effects (mean percentage of reduction during the rest periods)

Data presented in Table (3) revealed that Agrinate was more toxic than any insecticides or biocides in either initial or residual effect against *M. cartusiana* snail with reduction percentages of 93.29 and 68.99 % respectively.

On the other hand, Biovar gave reduction percentages 3.53 and 22.19 % in initial and residual effect, respectively. It noticed that Agrinate was more effective than any insecticides or biocides.

Regarding general means, Agrinate was more effective than Vertimec and Actara as insecticides, while Biovar was more effective than zantari as Biocides. Generally, Agrinate was more toxic than any insecticides or biocides where gave 77.17 % reduction, while Biovar gave 15.98 % reduction as biocides. It could be reported that Agrinate was more effective than any tested compounds.

The difference in toxicity of tested pesticides against snails could be explained on the basis of their chemical structure. The relationship between the chemical structure and the toxicity showed that among carbamate insecticides, thiocarb which is a dimer of the well know insecticide, methomyl containing N. methyl group with an additional carbamoyl moiety had the highest molluscicidal activity (Radwan and El- Wakil, 1991)

Ghamry (1997) found that toxic bait using for *Bacillus thuringiensis* var. K (B. T. K.) and *B. thuringiensis* var. Israe. (B.T.I.) were the most effective from dipping in water suspension and *B. thuringiensis* var. K was the highest efficacy from *B. thuringiensis* var. Isrea. It noticed that *Helicella vestalis* snail was more susceptible while *Eobania vermiculata* snail was the lowest one. Bait application tests of *B. thuringiensis* var K. gave high mortality percentage reach 100% for *H. vestalis*, while not exceed 62% for the same snail by using (B.T.I). On the other hand, dipping tests gave mortality 80% by using (B.T.K) and decreased to record 55% with (B.T.I.) against the same snail *H. vestails*.

Zedan *et al.* (1999) assured that the bacterial formulation of *B. thuringiensis* var *Israensis* was the most effective against *M. obstructa* snail. On the other hand, methomyl and oxamyl were tested against *M. cartusiana* and *Eobania vermiculata* snails under filed conditions. Methomyl induced a higher effect on the population reduction than oxamyl (Aioub *et al.*, 2000).

Moreover, Ismail *et al.* (2005) reported that methomyl gave the highest reduction percentages for *M. cartusiana* under field conditions.

Ismail *et al.* (2010) found that methomyl gave high reduction percentage than metaldehyde against *M. cartusiana* under field conditions.

Recently, Farage (2012) reported the residual effect of methomyl and metaldehyde on reducing population density of *M. cartusiana* snail as follows (71.48%) & (64.35), respectively.

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كفائة بعض المركبات على قوقع البرسيم الزجاجى موناكا كارتوسيانا (مولر) بمحافظة الشرقية

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تمت دراسة تأثير بعض المركبات (مبيدات حشرية ومبيدات حيوية) على قوقع البرسيم الزجاجى *Monacha cartusiana* بمحافظة الشرقية خلال موسمى ٢٠١١-٢٠١٢م. وأظهرت النتائج المعملية أن مركب اجرينيت هو الأكثر فاعلية ضد قوقع البرسيم الزجاجى حيث سجل متوسط نسبة موت وصلت إلى ٨٦.٣٣% بينما كان مبيد اكارارا هو الأقل فاعلية حيث سجل متوسط نسبة موت وصلت إلى ١١% وذلك بالنسبة للتركيز الأعلى. كما أظهرت النتائج الحقلية أيضا أن مبيد الاجرينيت هو الأكثر فاعلية فى خفض التعداد لقوقع البرسيم الزجاجى بينما كان المبيد الحيوى بيوفار هو الأقل فاعلية حيث كان متوسط نسب الخفض فى التعداد هي ٧٧.١٧ و ١٥.٩٨ % لكلا المبيدين على التوالى.

قام بتحكيم البحث

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